NPS Form 10-900
OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

VLR Listed: 9/17/2015
NRHP Listed: 12/15/2015

1. Name of Property

Historic name: Walter Reed Birthplace 2015 Update and Boundary Increase
Other names/site number: VDHR 036-0080
Name of related multiple property listing: N/A
(Enter "N/A" if property is not part of a multiple property listing

2. Location

Street & number: 4021 Hickory Fork Road
City or town: Gloucester State: Virginia County: Gloucester
Not For Publication: N/A Vicinity: X

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this _x_ nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property _x_ meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

_X_ national ___ statewide _X_ local

Applicable National Register Criteria:

_X_ A _X_ B _X_ C _X_ D

Julie V. Langan 10/20/15

Signature of certifying official/Title: **Date**

Virginia Department of Historic Resources

State or Federal agency/bureau or Tribal Government

In my opinion, the property _X_ meets ___ does not meet the National Register criteria.

Signature of commenting official: **Date**

Title : **State or Federal agency/bureau or Tribal Government**

4. National Park Service Certification

I hereby certify that this property is:

_x_ entered in the National Register

___ determined eligible for the National Register

___ determined not eligible for the National Register

___ removed from the National Register

___ other (explain:) _____

_____

Signature of the Keeper | Date of Action

5. Classification

Ownership of Property

(Check as many boxes as apply.)

Private:	X
Public – Local	
Public – State	
Public – Federal	

Category of Property

(Check only **one** box.)

Building(s)	X
District	
Site	
Structure	
Object	

Number of Resources within Property

(Do not include previously listed resources in the count)

Contributing	Noncontributing	
0	0	buildings
1	0	sites
0	0	structures
0	0	objects
1	0	Total

Number of contributing resources previously listed in the National Register 1

6. Function or Use

Historic Functions

(Enter categories from instructions.)

DOMESTIC: Single dwelling
COMMERCIAL: Store

Current Functions

(Enter categories from instructions.)

RECREATION AND CULTURE/Museum

7. Description

Architectural Classification
(Enter categories from instructions.)
OTHER: Three-bay Frame Dwelling

Materials: (enter categories from instructions.)
Principal exterior materials of the property: BRICK; WOOD

Narrative Description
(Describe the historic and current physical appearance and condition of the property. Describe contributing and noncontributing resources if applicable. Begin with **a summary paragraph** that briefly describes the general characteristics of the property, such as its location, type, style, method of construction, setting, size, and significant features. Indicate whether the property has historic integrity.)

Summary Paragraph
The Walter Reed Birthplace was listed in the National Register in 1973, and the original nomination focused tightly on the mid-19th century dwelling occupied by the Reed family and slightly less than 2 acres around it. Now operated by the Gloucester Preservation Foundation, the property's acreage has been enlarged to include four additional parcels totaling about 8 acres that were associated with the Reed Birthplace during the 19th century. Located at the northwest corner of the intersection of Rt. 614 (Hickory Fork Road) and Rt. 616 (Belroi Road) in rural Gloucester County and within the originally listed acreage, the modest dwelling that is known as the Walter Reed Birthplace is thought to have been built in the early 19th century as part of the small, rural Belroi community, located a few miles south of Gloucester Court House. The small one-and-a-half story, gable-roof, frame dwelling is an excellent example of antebellum vernacular architecture. It first was restored in 1927 by the Medical Society of Virginia and again in the 1970s by the Association for the Preservation of Virginia Antiquities (APVA; now Preservation Virginia). The first restoration removed a small, single-story addition to the back of the dwelling, but otherwise they repaired the building, leaving it with a significant level of historic integrity. Today the house is a rare surviving example of a once-prevalent building type, specifically representing the housing of working class property owners and tenants prior to the Civil War. The acreage between the dwelling and historic intersection once included a store and other mercantile-related buildings associated with the crossroads Belroi community; these are

now represented through their contributing archaeological remains, which has been designated Site 44GL0427. None of the four additional parcels include any architectural or known archaeological resources, but this land was historically associated with the Birthplace resources and contribute to the property's overall integrity of location, setting, feeling, and association.

Narrative Description

Setting

The Walter Reed Birthplace is located about one hundred feet northwest of the current intersection of Rt. 614 (Hickory Fork Road) and Rt. 616 (Belroi Road). Approximately 1.57 acres surrounding the historic building (Tax Parcel Map #s 30-146 and 30-145A) are within the original historic boundary of the 1973 NRHP designation. This area includes a manicured lawn and, to the southeast, pasture. Consisting of 4 current tax parcels (30-145, 30-145B, 30-145C, 30-145D), the additional eight acres associated with the 2015 boundary increase are located generally to the northwest, north, and northeast of the dwelling. This land consists of pasture and, exclusively to the northeast, young growth forest and low-lying swamp. The open, undeveloped character of the boundary increase area is in keeping with the property's rural heritage and setting.

Dwelling, The Walter Reed Birthplace, early 19th century (contributing building)

Thought to be constructed in the early 19th century, this small dwelling was located behind mercantile buildings fronting Hickory Fork Road that served the small, rural community of Belroi, located a few miles south of Gloucester Court House. It is a one-and-a-half story, wood frame dwelling clad in weatherboard. It rests on hand-made brick piers and is covered by a gable roof with cedar shake shingles installed ca. 1970. The simple, unassuming building has two chimneys on its east gable, one serving the primary (south) room (restored in 1927) and the other serving a secondary, rear room. The garret is above the primary room and is lit on the west gable by a four-over-four double-hung sash window, while six-over-six double-hung sash windows flank a central door on the south elevation, illuminating the primary room. A six-over-six double-hung sash window on the west gable and a four-over-four double-hung sash window on the north elevation illuminate the rear room. The rear room has an exterior entrance on the north elevation, offset to the west, while the window is offset to the east. The building once included a single-story frame addition with brick chimney and gable roof on the east gable; this was removed in 1927, likely because a Reed family member did not include it in her recollection of the house's mid-19th century appearance. The dwelling's interior is equally austere, including plastered walls, beaded base board, chair rails, and wood flooring, and a simple enclosed winding staircase in the southwest corner of the main room ascending to the garret, with a closet beneath it. The fireplace mantels are plain and consist of either a series of shelves and unadorned pilasters or a wide shelf. The north room is one step lower, and generally follows a similarly simple look, as does the garret above it. The Walter Reed Birthplace is an excellent example of antebellum domestic vernacular architecture and possesses a high level of historic integrity.

SECONDARY RESOURCE:

The Walter Reed Birthplace archaeological site (44GL0427), late eighteenth century to early twentieth century (contributing site)

The archaeological site boundaries coincide with the approximately 1.57 acres included in the property's 1973 National Register listing. A recent archaeological survey of this acreage has shown that Site 44GL0427 extends across this area, and also further to the north. Additional survey is pending, but the artifacts recovered to date match the primary occupation of the site (19th century) while showing some evidence of potentially earlier occupations that might originate in the late 18th century. The domestic material reflects activity areas consistent with a single dwelling of this period, including an intact and intense refuse midden to the rear of the dwelling. Excavations in this area identified cultural deposits that, together with shovel test survey evidence of buildings closer to the intersection, confirm a high level of horizontal and vertical integrity for the site. Oral history evidence of a well and documentary evidence of the house addition (removed in 1927) and potential other dependencies further suggest a dynamic landscape that would contribute greatly to our understanding of this community during its late 18th-/early 19th-century development around Stubbs Tavern, through its evolution into the early 20th-century community of Belroi (Harpole and Brown 2006; Harpole and Ogborne 2012; Brown et al, 2014; Harpole et al 2015).

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [x] A. Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [x] B. Property is associated with the lives of persons significant in our past.
- [x] C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [x] D. Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

- [ ] A. Owned by a religious institution or used for religious purposes
- [ ] B. Removed from its original location
- [x] C. A birthplace or grave
- [ ] D. A cemetery
- [ ] E. A reconstructed building, object, or structure
- [ ] F. A commemorative property
- [ ] G. Less than 50 years old or achieving significance within the past 50 years

Areas of Significance
(Enter categories from instructions.)
HEALTH/MEDICINE
ARCHITECTURE
COMMERCE
ARCHAEOLOGY – HISTORIC NON-ABORGINAL
CONSERVATION

Period of Significance
ca. 1810 – 1927

Significant Dates
1851 – birth of Walter Reed
1927 – restoration of the Birthplace

Significant Person
(Complete only if Criterion B is marked above.)
Reed, Walter Reed

Cultural Affiliation
European-American

Architect/Builder
Unknown

Statement of Significance Summary Paragraph (Provide a summary paragraph that includes level of significance, applicable criteria, justification for the period of significance, and any applicable criteria considerations.)

The Walter Reed Birthplace property, listed in the National Register in 1973, is eligible under Criterion B in the area of Health/Medicine for its association with Dr. Walter Reed, a nationally significant individual for his contributions to medical research that earned him the moniker the "conqueror of yellow fever." While Reed only lived here for the first six months of his life, there are no other known surviving residences for Dr. Reed; the property thus meets Criteria Consideration C for a birthplace or grave. Recent documentary and archaeological research proves the property is locally significant under Criterion A in the area of Commerce and under Criterion D in the area of Archaeology – Historic Non-Aboriginal. The property's primarily 19th-century archaeological site (44GL0427) includes intact stratified cultural deposits associated with the Walter Reed Birthplace, as well as the commercial development of this property and the historic intersection of Stubbs Tavern/Belroi. Additionally, the Walter Reed Birthplace is among the earliest historic preservation initiatives undertaken in Gloucester County, making the property locally significant under Criterion C in the areas of Conservation and Architecture for its illustration of early-20th -century historic preservation theory and methods. Due to this effort, the property retains a remarkably intact example of early 19th-century vernacular architecture, particularly representative of a common house form that is increasingly rare due to its unassuming style, small size, and general association with small property owners, tenant farmers, etc. With this boundary increase, the historic boundaries now encompass the full extent of this historic property, both during the time of Dr. Walter Reed's birth (1851) and the development of this intersection (ca. 1810 through the postbellum period). When originally listed in the National Register, the period of significance for Walter Reed Birthplace was broadly stated as "19th century." The inclusion of the archaeological research and recent documentary evidence refines this period to ca. 1810 through 1927, the year the Medical Society of Virginia restored the Birthplace and opened it as an historic site. Beyond recognition of the archaeological site there are no additional resources included within the increased boundary of the Walter Reed Birthplace.

Narrative Statement of Significance (Provide at least **one** paragraph for each area of significance.)

The Walter Reed Birthplace property was originally listing in the NRHP in 1973, at which time it included two parcels totaling slightly less than two acres at the intersection of Hickory Fork Road (Rt. 614) and Belroi Road (Rt. 616). The nomination included one broad area of significance, History, for the national significance of Dr. Walter Reed. Using today's areas of significance, Reed's significance is more appropriately placed in the area of Health/Medicine.

The boundary increase area encompasses the historic acreage owned by Jefferson W. Stubbs in 1851. Stubbs leased the property to Bellamy Church for use by traveling ministers, including

Reed's father. Owned by The Fairfield Foundation, parcel no. 30-145 is approximately one acre and the parcels no. 30-145B, -C, and –D, owned by Belroi Road, LLC, total approximately seven acres. The boundary increase from approximately 2 acres (over two parcels) to approximately 10 acres (over six parcels) encompasses the full extent of the historic Stubbs parcel during the mid-19th century and contributes to the overall character and setting of the property as it was associated with the mid-19th-century intersection, Belroi community, and Reed dwelling.

Criterion D: Archaeology – Prehistoric Non-Aboriginal and Criterion A: Commerce
Directly associated with the Walter Reed Birthplace property, archaeological site 44GL0427 includes evidence of locally significant archaeological remains related to the commercial development of this rural intersection in Gloucester County. It is highly reflective of the evolution of historic intersections in rural Virginia during the early 19th century and their emergence as antebellum community focal points through the development of country stores and other mercantile operations (augmenting the already-present tavern, ordinary, or blacksmith's shop). The archaeological and historical associations of the property illustrate the importance of retail stores as social and economic institutions of credit and marketplaces for local and imported goods. The inclusion of a small dwelling behind these establishments during the early 19th century, specifically the Walter Reed Birthplace, illustrates the range of building types and intersecting needs that were satisfied through investment in this property throughout the century.

In the first years of the 19th century, the land ownership at this intersection followed a common pattern for this period where a handful of property owners owned relatively large acreages separated by roadways and occasionally geographic features, such as creeks and ravines. The lack of large plantations or direct access to navigable water in the immediate area suggests that the surrounding landowners were middling level farmers who lived on their properties and formed a loose-knit community around a significant road intersection. The earliest known development of the intersection began with John Camp's 1809 purchase of 7 acres (directly across the intersection from the Birthplace property) which may mark the first instance of an individual purchasing property at the intersection specifically to take advantage of this location's traffic.

The first development of a commercial building on the Birthplace property was Francis Stubbs' establishment of Stubbs Store by 1811. Development continued at the intersection for the next several decades, including the establishment of "Stubbs Tavern" across Belroi Road. Subsequent owners of Stubbs Store included Henry Hughes & Co. (1840-1844) and Hughes and Jefferson W. Stubbs (1844-1852). Plans for constructing a Methodist Episcopal Parsonage began in 1851, specifically for minister Lemuel Sutton Reed (Walter Reed's father), brought further development to the area, along with the construction of the Belroi House (DHR #036-0039) by William Roy Jones, by then the largest property owner in the area.

Despite the economic turmoil of the post-Civil War period, including several foreclosures and bankruptcies, a more populous and interconnected community created a sufficient market for

Samuel Turbill of Baltimore to construct an office/storehouse on 1/5th acre south of the intersection in 1869, which Ishaman M. Leavitt purchased in 1870. This marked another substantial development in the Belroi community as the intersection merited a post office and was frequently referenced as a landmark in legal documents (Brown et al. 2014).

The commercial activities that took place at the Walter Reed Birthplace property reflect its role in the development of businesses and communities in Gloucester across the 19th century, a period characterized by a succession of merchant owners whose business partnerships, often with one another and with other Gloucester store-keepers, illuminate the lives and circumstances of the emerging mercantile and professional middle class and the networks and strategies they maintained to remain financially stable. Local store owners regularly purchased merchandise from each other, often on credit, to keep their inventories supplied. This practice, along with frequent temporary partnerships formed between merchants, revealed efforts on the part of Gloucester's businessmen to foster mercantile competition while mutually ensuring the stability of their profession, with smaller merchants operating as agents or suppliers for larger firms.[1]

Criterion C: Architecture and Conservation

The purchase of the Walter Reed Birthplace property in 1926 by the Medical Society of Virginia marks a significant moment in the history of historic preservation in Gloucester County. The society's subsequent restoration of the building, retaining much of the original fabric while selectively removing elements believed to postdate the Reed family occupation, was in keeping with then-current preservation theory and was intended to highlight the significance of Dr. Walter Reed as one of the foremost medical researchers in the United States. The purchase, preservation, and restoration of this property not only ensured that the association of Reed with Gloucester County would be maintained throughout the 20th century, but also highlighted the post-Civil War accomplishments of southern-born and educated doctors during a period when much of the emphasis on celebrating the South's past was on its colonial forefathers and elite plantation owners of the Virginia colony. Emphasis on the relatively modest upbringing of the son of a Methodist minister, and the simple house in which they lived, shows that the preservation movement, whether intentionally or not, could have moments of relative diversity.

Equally important was the preservation of a building type, with simple plan and austere adornment, which stood in marked contrast to the lavish dwellings more frequently preserved and restored during this period. The house's relatively simple design, materials, and workmanship are illustrative of historically common small dwellings occupied by families of middling means. Their very ubiquity and unassuming appearance likely allowed such buildings to be easily overlooked. The Reed dwelling, however, is notable as an intact and well-preserved example of a mid-19th century, vernacular three-bay form with retention of a substantial percentage of its historic fabric. The loss of the small rear addition during the 1927 restoration removed what today would be considered historic fabric but was in keeping with preservation theory of the period, which emphasized restoration to a perceived original appearance at the time of a property's greatest significance, in this case, the birth of Walter Reed.

9. Major Bibliographical References

Bibliography (Cite the books, articles, and other sources used in preparing this form.)

In addition to the bibliography included in the original nomination:

Brown, David, Thane Harpole, and Stephen Fonzo. "Walter Reed Birthplace/Belroi Community Mapping Project," 2014. Virginia Department of Historic Resources.

Harpole, Thane, Jenn Ogborne, and David Brown. "A Survey and Limited Excavation at the Walter Reed Birthplace Property (Site 44GL427)," Quarterly Bulletin of the Archeological Society of Virginia, 2015.

Harpole, Thane, and David Brown. "An Archaeological Assessment of Walter Reed's Birthplace, Site 44GL427, Gloucester County, Virginia," 2006. Virginia Department of Historic Resources.

Harpole, Thane, and Jennifer Ogborne. "The Excavation of a Test Unit at Walter Reed's Birthplace, Site 44GL427; Summary Report," 2012. Virginia Department of Historic Resources.

Previous documentation on file (NPS):

____ preliminary determination of individual listing (36 CFR 67) has been requested
____ previously listed in the National Register
____ previously determined eligible by the National Register
____ designated a National Historic Landmark
____ recorded by Historic American Buildings Survey #_____
____ recorded by Historic American Engineering Record # _____
____ recorded by Historic American Landscape Survey # _____

Primary location of additional data:

_X_ State Historic Preservation Office
____ Other State agency
____ Federal agency
____ Local government
____ University
____ Other
Name of repository: Virginia Department of Historic Resources, Richmond, VA

Historic Resources Survey Number (if assigned): DHR no. 036-0080

10. Geographical Data

Acreage of Property approximately 9.57
Use either the UTM system or latitude/longitude coordinates

Latitude/Longitude Coordinates
Datum if other than WGS84:_____
(enter coordinates to 6 decimal places)

1. Latitude: 37.3884620 Longitude: -76.5881866
2. Latitude: Longitude:
3. Latitude: Longitude:
4. Latitude: Longitude:

Or
UTM References
Datum (indicated on USGS map):

☐ NAD 1927 or ☐ NAD 1983

1. Zone:	Easting:	Northing:
2. Zone:	Easting:	Northing:
3. Zone:	Easting:	Northing:
4. Zone:	Easting :	Northing:

Verbal Boundary Description (Describe the boundaries of the property.)
The verbal boundary encompasses the following tax parcels as recorded by Gloucester County, Virginia: Parcel nos. 30-146, 30-145, 30-145A, 30-145B, 30-145C, and 30-145D. The true and correct historic boundary is shown on the sketch map entitled "Walter Reed Birthplace 2015 Update and Boundary Increase, Gloucester County, Virginia, 036-0080."

Boundary Justification (Explain why the boundaries were selected.)
The expanded boundary encompasses four new parcels, each historically associated with the property during the revised period of significance, augmenting the two parcels associated with the original Walter Reed Birthplace nominated property, listed in 1973. There are no

additional resources located exclusively within the expanded boundary. The archaeological site (44GL0427) extends over the entire original acreage and into the expanded acreage.

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11. Form Prepared By

name/title: Dr. David A. Brown and Thane H. Harpole
organization: The Fairfield Foundation
street & number: P.O. Box 157
city or town: White Marsh state: VA zip code: 23183
e-mail: fairfield@fairfieldfoundation.org
telephone: 804-815-4467
date: July 2015

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.
- **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to this map.
- **Additional items:** (Check with the SHPO, TPO, or FPO for any additional items.)

Photographs

Submit clear and descriptive photographs. The size of each image must be 1600x1200 pixels (minimum), 3000x2000 preferred, at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map. Each photograph must be numbered and that number must correspond to the photograph number on the photo log. For simplicity, the name of the photographer, photo date, etc. may be listed once on the photograph log and doesn't need to be labeled on every photograph.

Photo Log

Name of Property: The Walter Reed Birthplace
City or Vicinity: Gloucester
County: Gloucester State: Virginia
Photographer: David A. Brown
Date Photographed: 7/14/2015

Description of Photograph(s) and number, include description of view indicating direction of camera:

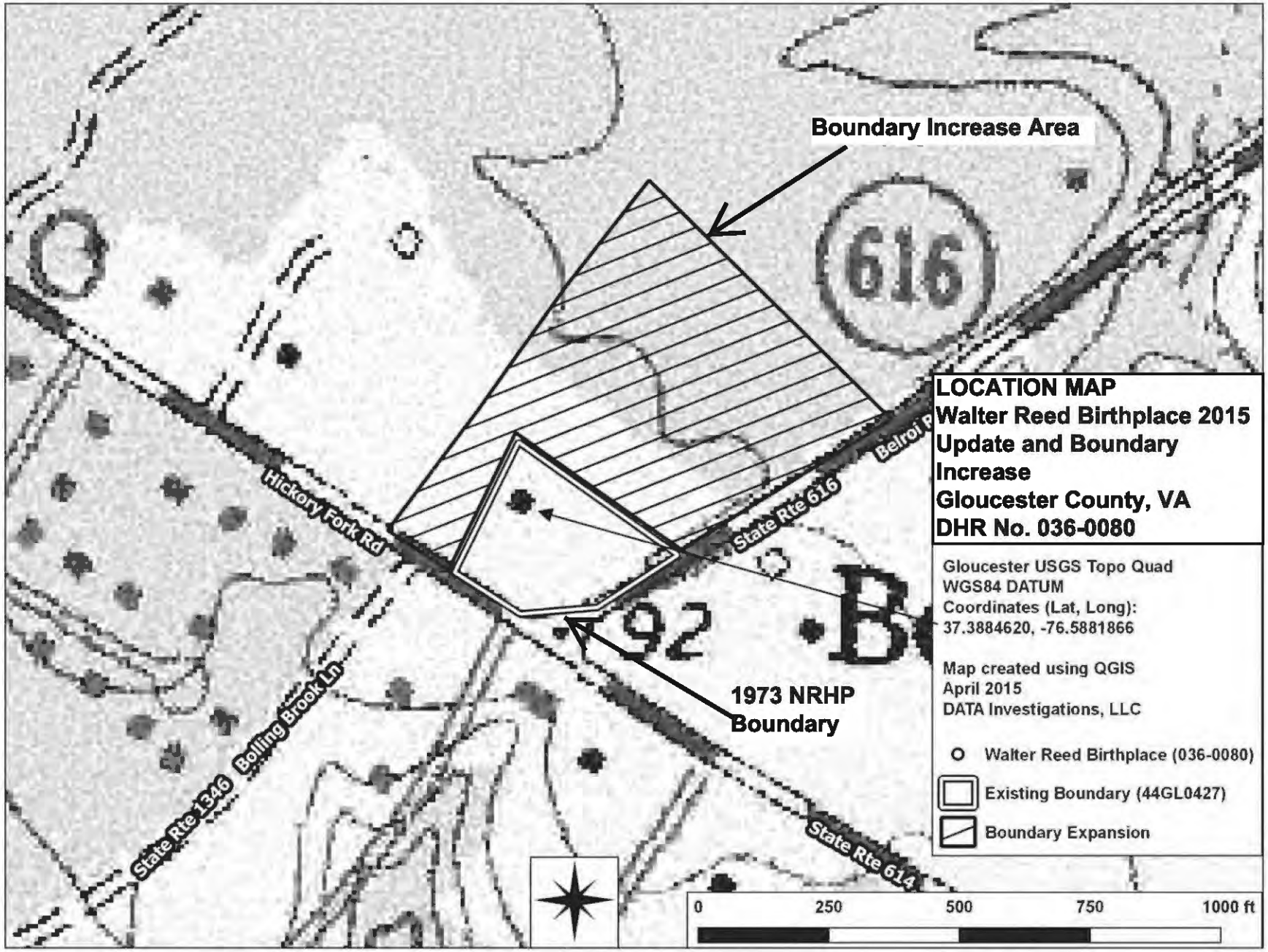
1 of 5. The Walter Reed Birthplace, facing northeast.
VA_GloucesterCounty_WalterReedBirthplace2015Update_0001.

2 of 5. The Walter Reed Birthplace, facing north.
VA_GloucesterCounty_WalterReedBirthplace2015Update_0002.

3 of 5. The Walter Reed Birthplace, facing north.
VA_GloucesterCounty_WalterReedBirthplace2015Update_0003.

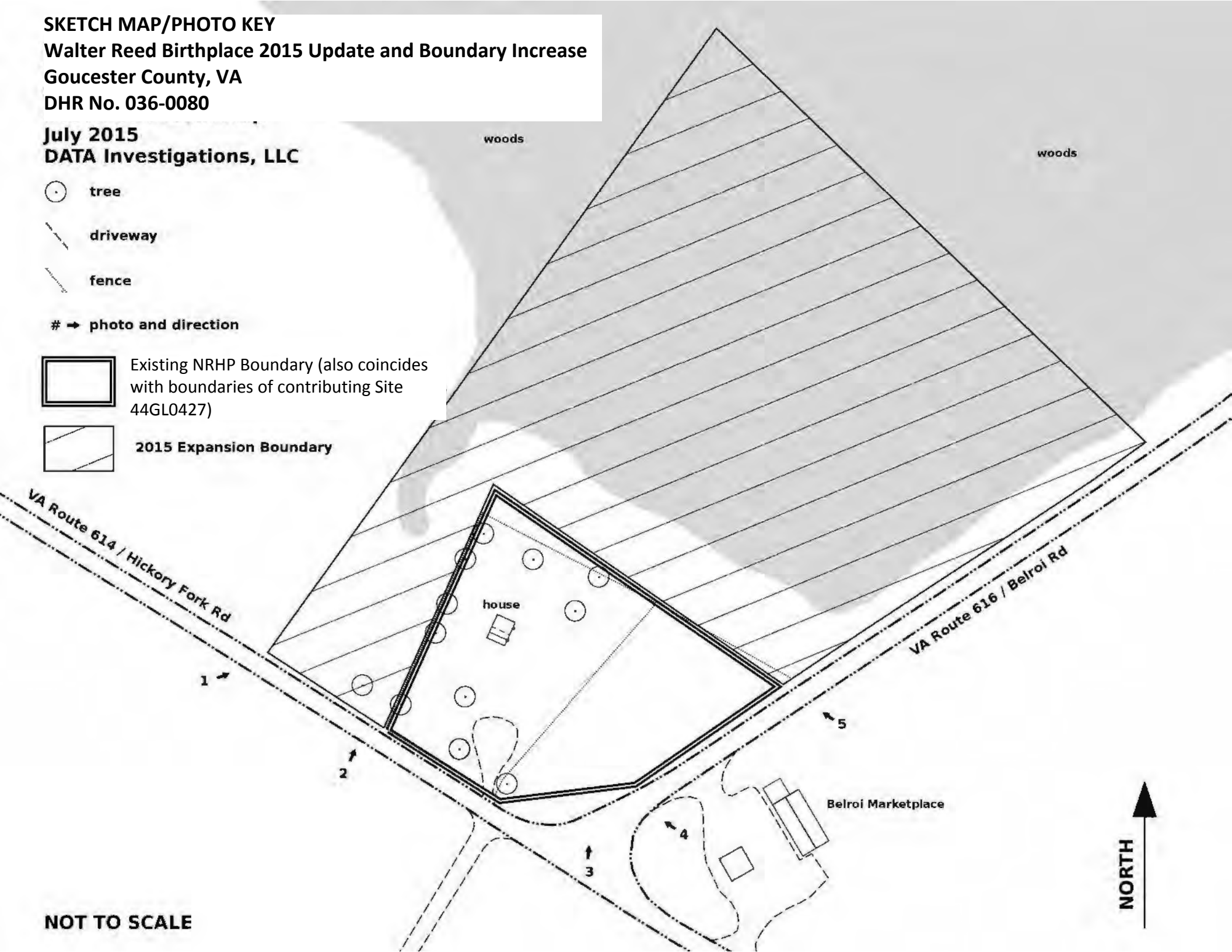
4 of 5. The Walter Reed Birthplace, facing northwest.
VA_GloucesterCounty_WalterReedBirthplace2015Update_0004.

5 of 5. The Walter Reed Birthplace, facing northwest.
VA_GloucesterCounty_WalterReedBirthplace2015Update_0005.


Boundary Increase Area
616
LOCATION MAP
Walter Reed Birthplace 2015 Update and Boundary Increase
Gloucester County, VA
DHR No. 036-0080
Gloucester USGS Topo Quad
WGS84 DATUM
Coordinates (Lat, Long):
37.3884620, -76.5881866
Map created using QGIS
April 2015
DATA Investigations, LLC
Hickory Fork Rd
State Rte 616
Belroi
92
1973 NRHP Boundary
Bolling Brook Ln
State Rte 1346
State Rte 614
Walter Reed Birthplace (036-0080)
Existing Boundary (44GL0427)
Boundary Expansion
0
250
500
750
1000 ft

SKETCH MAP/PHOTO KEY
Walter Reed Birthplace 2015 Update and Boundary Increase
Goucester County, VA
DHR No. 036-0080

July 2015
DATA Investigations, LLC



ADDITIONAL DOCUMENTATION:
Walter Reed Birthplace 2015 Update and Boundary Increase
Gloucester County, Virginia
DHR No. 036-0080

Oxford Tree-Ring Laboratory
Report 2015/04

The Tree-Ring Dating of the Walter Reed Birthplace, Gloucester, Virginia

Michael J. Worthington and Jane I. Seiter

Oxford Tree-Ring Laboratory
25 East Montgomery Street, Baltimore, MD 21230
michael@dendrochronology.com
www.dendrochronology.com
410-929-1520

September 2015

ADDITIONAL DOCUMENTATION:
Walter Reed Birthplace 2015 Update and Boundary Increase
Gloucester County, Virginia
DHR No. 036-0080

Summary:

Walter Reed Birthplace, Gloucester, Virginia (37.388472, -76.588118)

Main House *Felling dates:* **Winter 1819/20 and Summer 1821**

Stud (0/4); Joist (1/2) 1820 (½C); Brace (1/1) 1819 (C); Wallplate (1/1) 1813 h/w only; Corner Post (1/1) 1813 h/w only; *Site Master* 1745-1820 (pine) WRBVx2 (*t* = 7.02 BAC; 6.31 FSQx2; 6.22 VAPINE2B).

This small house, comprising a single room with a later lean-to on the back and a loft above the main room, is the birthplace of Dr. Walter Reed, the famous U. S. Army physician and medical hero of the Spanish-American War. Reed was born here on September 13, 1851, after his father, a Methodist minister, was transferred to Gloucester. The Reed family briefly lived here until a new parsonage was completed in 1852. The house is now operated as a museum by the Joseph Bryan Branch of Preservation Virginia (Preservation Virginia 2015).

Dendrochronological analysis has shown that the original structure was built in the summer of 1821 or shortly thereafter.

Date sampled: September 26, 2012, and November 19, 2013

Commissioner: David Brown, DATA Investigations

Owner: Joseph Bryan Branch of Preservation Virginia

Summary published: **www.dendrochronology.com**

How Dendrochronology Works

Dendrochronology has over the past few decades become one of the leading and most accurate scientific dating methods. While not always successful, when it does work, it is precise, often to the season of the year. Tree-ring dating to this degree of precision is well known for its use in dating historic buildings and archaeological timbers. However, more ancillary objects such as doors, furniture, panel paintings, and wooden boards in medieval book-bindings can sometimes be successfully dated.

The science of dendrochronology is based on a combination of biology and statistics. In temperate zones, a tree puts on a new layer of growth underneath the bark every year, with the effect being that the tree grows wider and taller as it ages. Each annual ring is composed of the growth which takes place during the spring and summer and continues until about November, when the leaves are shed and the tree becomes dormant for the winter period. For the two principal American oaks, the white and red (*Quercus alba* and *Q. rubra*), as well as for the black ash (*Fraxinus nigra*) and many other species, the annual ring is composed of two distinct parts: the spring growth or early wood, and the summer growth, or late wood. Early wood is composed of large vessels formed during the period of shoot growth which takes place between March and May, before the establishment of any significant leaf growth. This is produced by using most of the energy and raw materials laid down the previous year. Then, there is an abrupt change at the time of leaf expansion around May or June when hormonal activity dictates a change in the quality of the xylem, and the summer growth, or late wood, is formed. Here the wood becomes increasingly fibrous and contains much smaller vessels. Trees with this type of growth pattern are known as ring-porous, and are distinguished by the contrast between the open, light-colored early wood vessels and the dense, darker-colored late wood.

Other species of tree, such as tulip poplar (*Liriodendron tulipifera L.*), are known as diffuse-porous. Unlike the ring-porous trees, the spring vessels consist of very small spring vessels that become even smaller as the tree advances into the summer growth. The annual growth rings are often very difficult to distinguish under even a powerful microscope, and one often needs to study the medullary rays, which thicken at the ring boundaries.

Dendrochronology utilizes the variation in the width of the annual rings as influenced by climatic conditions common to a large area, as opposed to other more local factors such as woodland competition and insect attack. It is these climate-induced variations in ring widths that allow calendar dates to be ascribed to an undated timber when compared to a firmly-dated sequence. If a tree section is complete to the bark edge, then when dated a precise date of felling can be determined. The felling date will be precise to the season of the year, depending on the degree of formation of the outermost ring. Therefore, a tree with bark that has the spring vessels formed but no summer growth can be said to be felled in the spring, although it is not possible to say in which particular month the tree was felled.

Another important dimension to dendrochronological studies is the presence of sapwood and bark. This is the band of growth rings immediately beneath the bark and comprises the living growth rings which transport the sap from the roots to the leaves. This sapwood band is distinguished from the heartwood by the prominent features of color change and the blocking of the spring vessels with tyloses, the waste products of the tree's growth. The heartwood is generally darker in color, and the spring vessels are usually blocked with tyloses. The heartwood is dead tissue, whereas the sapwood is living, although the only really living, growing, cells are in the cambium, immediately beneath the bark. In the American white oak (*Quercus* alba), the difference in color is not generally matched by the change in the spring vessels, which are often filled by tyloses to within a year or two of the terminal ring. Conversely, the spring vessels in the American red oak (*Q* rubra) are almost all free of tyloses, right to the pith. Generally the sapwood retains stored food and is therefore attractive to insect and fungal attack once the tree is felled and therefore is often removed during conversion.

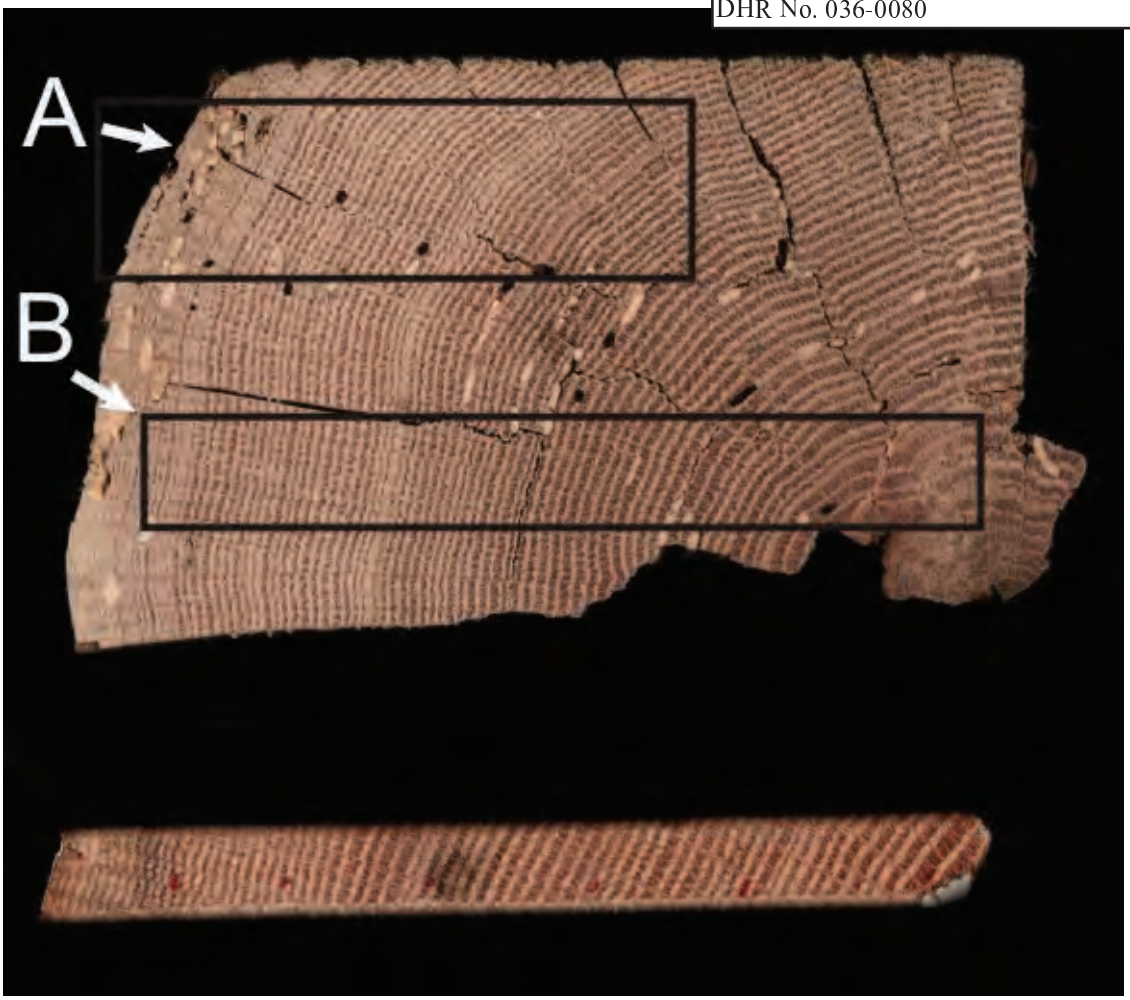


Figure 1. A cross-section of an oak timber with sapwood rings on the left-hand side (above). The boxes illustrate conversion methods resulting in **A)** a precise felling date and **B)** a *terminus post quem* or felled after date. Also pictured is a core showing complete sapwood (below).

Methodology: The Dating Process

All samples were from what appeared to be primary first-use timbers. Timbers that looked most suitable for dendrochronological purposes—those with complete sapwood or reasonably long ring sequences—were selected. *In-situ* timbers were sampled through coring, using a 16 mm hollow auger.

The dry samples were sanded on a linisher, or bench-mounted belt sander, using 60 to 1200 grit abrasive paper, and were cleaned with compressed air to allow the ring boundaries to be clearly distinguished. They were then measured under a x10/x30 microscope using a travelling stage electronically displaying displacement to a precision of 0.01mm. Thus each ring or year is represented by its measurement which is arranged as a series of ring-width indices within a data set, with the earliest ring being placed at the beginning of the series, and the latest or outermost ring concluding the data set.

As indicated above, the principle behind tree-ring dating is a simple one: the seasonal variations in climate-induced growth as reflected in the varying width of a series of measured annual rings is compared with other, previously dated ring sequences to allow precise dates to be ascribed to each ring. When an undated sample or site sequence is compared against a dated sequence, known as a reference chronology, an indication of how good the match is must be determined. Although it is almost impossible to define a visual match, computer comparisons can be accurately quantified. While it may not be the best statistical

indicator, Student's (a pseudonym for W S Gosset) *t*-value has been widely used among dendrochronologists. The cross-correlation algorithms most commonly used and published are derived from Baillie and Pilcher's CROS program (Baillie and Pilcher 1973).

Generally, *t*-values over 3.5 should be considered significant, although in reality it is common to find demonstrably spurious *t*-values of 4 and 5 because more than one matching position is indicated. For this reason, dendrochronologists prefer to see some *t*-value ranges of 5, 6, or higher, and for these to be well replicated from different, independent chronologies with local and regional chronologies well represented. Users of dates also need to assess their validity critically. They should not have great faith in a date supported by a handful of *t*-values of 3s with one or two 4s, nor should they be entirely satisfied with a single high match of 5 or 6. Examples of spurious *t*-values in excess of 7 have been noted, so it is essential that matches with reference chronologies be well replicated, and that this is confirmed with visual matches between the two graphs. Matches with *t*-values of 10 or more between individual sequences usually signify having originated from the same parent tree.

In reality, the probability of a particular date being valid is itself a statistical measure depending on the *t*-values. Consideration must also be given to the length of the sequence being dated as well as those of the reference chronologies. A sample with 30 or 40 years growth is likely to match with high *t*-values at varying positions, whereas a sample with 100 consecutive rings is much more likely to match significantly at only one unique position. Samples with ring counts as low as 50 may occasionally be dated, but only if the matches are very strong, clear, and well replicated, with no other significant matching positions. This is essential for intra-site matching when dealing with such short sequences. Consideration should also be given to evaluating the reference chronology against which the samples have been matched: those with well-replicated components that are geographically near to the sampling site are given more weight than an individual site or sample from far away.

It is general practice to cross-match samples from within the same phase to each other first, combining them into a site master, before comparing with the reference chronologies. This has the advantage of averaging out the "noise" of individual trees and is much more likely to obtain higher *t*-values and stronger visual matches. After measurement, the ring-width series for each sample is plotted as a graph of width against year on log-linear graph paper. The graphs of each of the samples in the phase under study are then compared visually at the positions indicated by the computer matching and, if found satisfactory and consistent, are averaged to form a mean curve for the site or phase. This mean curve and any unmatched individual sequences are compared against dated reference chronologies to obtain an absolute calendar date for each sequence. Sometimes, especially in urban situations, timbers may have come from different sources and fail to match each other, thus making the compilation of a site master difficult. In this situation samples must then be compared individually with the reference chronologies.

Therefore, when cross-matching samples with each other, or against reference chronologies, a combination of both visual matching and a process of qualified statistical comparison by computer is used. For this study, the ring-width series were compared on an IBM compatible computer for statistical cross-matching using a variant of the Belfast CROS program (Baillie and Pilcher 1973).

Ascribing and Interpreting Felling Dates

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. For samples that have sapwood complete to the underside of, or including, bark, this process is relatively straight forward. Depending on the completeness of the final ring, i.e. if it has only the early wood formed, or the latewood, a *precise felling date and season* can be given. Where the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then the question of when the tree was felled becomes considerably more complicated. In the European oaks, sapwood tends to be of a

relatively constant width and/or number of rings, and it is possible to estimate the approximate number of sapwood rings that are missing from any given timber.

Unfortunately, it has not been possible to apply an accurate sapwood estimate to either the white or red oaks at this time. Primarily, it would appear that there is a complete absence of literature on sapwood estimates for oak anywhere in the country (Grissino-Mayer, *pers comm*). The matter is further complicated in that the sapwood in white oak (*Quercus alba*) occurs in two bands, with only the outer ring or two being free of tyloses in the spring vessels (Gerry 1914; Kato and Kishima 1965). Out of some 50 or so samples, only a handful had more than 3 rings of sapwood without tyloses. The actual sapwood band is differentiated sometimes by a lighter color, although this is often indiscernible (Desch 1948). In archaeological timbers, the lighter colored sapwood does not collapse as it does in the European oak (*Q rober*), but only the last ring or two without tyloses shrink tangentially. In these circumstances the only way of being able to identify the heartwood/sapwood boundary is by recording how far into the timber wood boring beetle larvae penetrate, as the heartwood is not usually susceptible to attack unless the timber is in poor or damp conditions. Despite all of these drawbacks, some effort has been made in recording sapwood ring counts on white oak, although the effort is acknowledged to be somewhat subjective.

As for red oaks (*Quercus rubra*) it will probably not be possible to determine a sapwood estimate as these are what are known as "sapwood trees" (Chattaway 1952). Whereas the white oak suffers from an excess of tyloses, these are virtually non-existent in the red oak, even to the pith. Furthermore, there is no obvious color change throughout the section of the tree, and wood-boring insects will often penetrate right through to the center of the timber. Therefore, in sampling red oaks, it is vital to retain the final ring beneath the bark, or to make a careful note of the approximate number of rings lost in sampling, if any meaningful interpretation of felling dates is to be made. Similarly, no study has been made in estimating the number of sapwood rings in tulip-poplar, black ash, or any of the pines.

Therefore, if the bark edge does not survive on any of the timbers sampled, only a *terminus post quem* or *felled after* date can be given. The earliest possible felling date would be the year after the last measured ring date, adjusted for any unmeasured rings or rings lost during the process of coring.

Some caution must be used in interpreting solitary precise felling dates. Many instances have been noted where timbers used in the same structural phase have been felled one, two, or more years apart. Whenever possible, a group of precise felling dates should be used as a more reliable indication of the construction period. It must be emphasized that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure under study. However, it is common practice to build timber-framed structures with green or unseasoned timber and therefore construction usually took place within twelve to eighteen months of felling (Miles 1997).

Details of Dendrochronological Analysis

The results of the dendrochronological analysis for the buildings under study are presented in a number of detailed tables. The most useful of these is the summary **Table 1**. This gives most of the salient results of the dendrochronological process, and includes details for each sample, such as its species, location, and felling date, if successfully tree-ring dated. This last column is of particular interest to the end user, as it gives the actual year and season when the tree was felled, if bark or bark edge is present. If bark edge is not present, it gives a *terminus post quem* or date after which the timber was felled. Often these *terminus post quem* dates begin far earlier than any associated precise felling dates. This is simply because far more rings have been lost in the initial conversion of the timber. If the sapwood was complete on the timber but some was lost during coring, an estimated date range can sometimes be given.

It will also be noticed that often the precise felling dates will vary within several years of each other. Unless there is supporting archaeological evidence suggesting different phases, all this would indicate is either

stockpiling of timber, or of trees that had been felled or died at varying times but were not cut up until the commencement of the particular building operations in question. When presented with varying precise felling dates, one should always take the latest date for the structure under study, and it is likely that construction will have been completed for ordinary vernacular buildings within twelve or eighteen months from this latest felling date (Miles 1997).

Table 2 gives an indication of the statistical reliability of the match between one sequence and another. This shows the *t*-value over the number of years overlap for each combination of samples in a matrix table. It should be born in mind that *t*-values with less than 80 rings overlap may not truly reflect the same degree of matching and that spurious matches may produce similar values.

First, multiple radii have been cross-matched with each other and combined to form same-timber means. These are then compared with other samples from the site and any which are found to have originated from the same parent tree are again similarly combined. Finally, all samples, including all same timber and same tree means, are combined to form one or more site masters. Again, the cross-matching is shown as a matrix table of *t*-values over the number of years overlaps. Reference should always be made to **Table 1** to clearly identify which components have been combined.

Table 3 shows the degree of cross-matching between the site master(s) and a selection of reference chronologies. This shows the state or region from which the reference chronology originated, the common chronology name, the publication reference, and the years covered by the reference chronology. The number of overlapping years between the reference chronology and the site master is also shown together with the resulting *t*-value. It should be noted that well replicated regional reference chronologies, which are shown in **bold**, will often produce better matches than individual site masters or indeed individual sample sequences.

Figures include a bar diagram that shows the chronological relationship between two or more dated samples from a phase of building and any plans showing sample locations, if available.

Publication of all dated sites for English buildings occurs annually in *Vernacular Architecture*, but regrettably there is at the present time no vehicle available for the publication of dated American buildings. However, a similar entry is shown on the summary page of the report, which could be used in any future publication of American dates. This does not give as much technical data for the samples dated, but does give the *t*-value matches against the relevant chronologies, provides a short descriptive paragraph for each building or phase dated, and gives a useful short summary of samples dated. These summaries are also listed on the web-site maintained by the Laboratory, which can be accessed at www.dendrochronology.com. The Oxford Tree-Ring Laboratory retains copyright of this report, but the commissioner of the report has the right to use the report for his or her own use so long as the authorship is quoted. Primary data and the resulting site master(s) used in the analysis are available from the Laboratory on request by the commissioner and bona fide researchers. The samples form part of the Laboratory archives, unless an alternative archive, such as the Colonial Williamsburg Foundation in association with the Oxford Tree-Ring Laboratory, has been specified in advance.

Sampling

A dendrochronological study of the Walter Reed Birthplace was undertaken in an attempt to date the primary construction phase of the building. After a thorough inspection of the structure, it was found that all of the timbers in the first-floor main room and in the loft above were fully covered with plaster and, consequently, inaccessible for testing. Timbers in the crawlspace underneath the building were covered with plywood and wire mesh to deter groundhogs, which made the floor joists similarly inaccessible. The only accessible timbers found in the building were two yellow pine studs located inside the cupboard underneath the first-floor staircase.

An opportunity for further sampling arose more than a year later when a section of plaster from the first floor became loose and needed replacing. This allowed two ceiling joists, a brace, a wallplate, a corner post, and two further studs to be sampled.

The position of each of the samples was noted at the time of sampling. Each sample was given the code **wrbv** (for Walter Reed Birthplace, Virginia) and numbered 1 and 2 during the first visit and 11 to 17 during the second visit (see table 1).

Summary of Dating

Bark edge survived on three of the nine timbers sampled. The outer wood of two of the sampled timbers was too soft to survive sampling, so multiple samples were taken from each in an attempt to get complete sapwood. The multiple samples were combined to form the individual mean sample sequences **wrbv1** and **wrbv11,** which were used in the rest of the analysis (see table 2).

The nine yellow pine sequences were compared with each other. Two were found to match with a *t*-value of 4.19, which allowed them to be combined into the 60-year site master **WRBVx1**. A further four samples were also found to match each other, which allowed them to be combined into a second 76-year site master **WRBVx2.**

The two new site masters were compared with more than seven hundred master chronologies from the East Coast of the United States. While **WRBVx1** did not correspond with any of these chronological sequences, **WRBVx2** was found to match sequences spanning the years 1745 to 1820. The remaining individual timber sequences were also compared with the master chronologies but were not found to match any of them.

Interpretation

The tree-ring analysis has resulted in the successful dating of the Walter Reed Birthplace. Two of the timbers that formed the dated site master **WRBVx2** retained complete sapwood. A brace from the north wall (**wrbv13**) gave a precise felling date of the winter of 1819/20, while a joist from the ceiling (**wrbv12**) gave a precise felling date of the summer of 1821, leading to the conclusion that the primary construction phase of the house took place in the summer of 1821 or shortly thereafter.

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ADDITIONAL DOCUMENTATION:
Walter Reed Birthplace 2015 Update and Boundary Increase
Gloucester County, Virginia
DHR No. 036-0080

Table 1: Summary of tree-ring dating

WALTER REED BIRTHPLACE, GLOUCESTER, VIRGINIA

Sample number & type		Species	Timber and position	Dates AD spanning	Last Ring	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges
wrbv1a	c	PISP	Stud south wall 1st from west wall	-	h/w only	50	1.71	0.40	0.156	
wrbv1b	c	PISP	ditto	-	3nm ½C	27	1.54	0.29	0.185	
† **wrbv1**	m		Mean of **wrbv1a** + **wrbv1b**	-	3nm ½C	50	1.70	0.40	0.166	
† **wrbv2**	c	PISP	Stud west wall 2nd from south wall	-	h/w only	36	1.07	0.42	0.319	
wrbv11a	c	PISP	Ceiling joist 3rd from east wall	-	h/w only	43	1.87	1.46	0.213	
wrbv11b	c	PISP	ditto	-	h/w only	17	1.00	0.25	0.186	
wrbv11	m		Mean of **wrbv11a** + **wrbv11b**	-	h/w only	43	1.87	1.46	0.211	
* **wrbv12**	c	PISP	Ceiling joist 2nd from east wall	1746-1820	½C	75	1.47	1.53	0.257	Summer 1821
* **wrbv13**	c	PISP	Brace north wall east end	1747-1819	C	73	1.58	0.66	0.236	Winter 1819/20
* **wrbv14**	c	PISP	Wallplate north wall	1751-1813	h/w only	63	1.51	0.77	0.223	
wrbv15	c	PISP	Stud north wall 2nd from east	-	h/w only	35	1.75	0.58	0.155	
wrbv16	c	PISP	Stud upper north wall 1st from east	-	h/w only	25	1.55	0.38	0.167	
* **wrbv17**	c	PISP	Corner post northeast corner	1745-1813	h/w only	69	1.79	1.45	0.215	
† = WRBVx1 Site Master				**-**		**60**	**1.43**	**0.41**	**0.234**	
*** = WRBVx2 Site Master**				**1745-1820**		**76**	**1.63**	**1.12**	**0.169**	

Key: *, †, § = sample included in site-master; c = core; mc = micro-core; s = slice/section; g = graticule; p = photograph; ¼C, ½C, C = bark edge present, partial or complete ring: ¼C = spring (last partial ring not measured), ½C = summer/autumn (last partial ring not measured), or C = winter felling (ring measured); h/w only = heartwood only; nm = number of unmeasured rings; std devn = standard deviation; mean sens = mean sensitivity; PISP = *Pinus L.* (Southern yellow pine)

Explanation of terms used in Table 1

The summary table gives most of the salient results of the dendrochronological process. For ease in quickly referring to various types of information, these have all been presented in Table 1. The information includes the following categories:

Sample number: Generally, each site is given a two or three letter identifying prefix code, after which each timber is given an individual number. If a timber is sampled twice, or if two timbers were noted at time of sampling as having clearly originated from the same tree, then they are given suffixes '**a**', '**b**', etc. Where a core sample has broken, with no clear overlap between segments, these are differentiated by a further suffix '**1**', '**2**', etc.

Type shows whether the sample was from a core 'c', or a section or slice from a timber's'. Sometimes photographs are used 'p', or timbers measured *in situ* with a graticule 'g'.

Species gives the four-letter species code used by the International Tree-Ring Data Bank, at NOAA. These are identified in the key at the bottom of the table.

Timber and position column details each timber sampled along with a location reference. This will usually refer to a bay or truss number, or relate to compass points or to a reference drawing.

Dates AD spanning gives the first and last measured ring dates of the sequence (if dated),

H/S bdry is the date of the heartwood/sapwood transition or boundary (if identifiable).

Sapwood complement gives the number of sapwood rings, if identifiable. The tree starts growing in the spring during which time the earlywood is produced, also known also as spring growth. This consists of between one and three decreasing spring vessels and is noted as *Spring* felling and is indicated by a ¼ C after the number of sapwood ring count. Sometimes this can be more accurately pin-pointed to very early spring when just a few spring vessels are visible. After the spring growing season, the latewood or summer growth commences, and is differentiated from the proceeding spring growth by the dense band of tissue. This summer growth continues until just before the leaves drop, in about October. Trees felled during this period are noted as *summer* felled (½ C), but it is difficult to be too precise, as the width of the latewood can be variable, and it can be difficult to distinguish whether a tree stopped growing in autumn or *winter*. When the summer growth band is clearly complete, then the tree would have been felled during the dormant winter period, as shown by a single C. Sometimes a sample will clearly have complete sapwood, but due either to slight abrasion at the point of coring, or extremely narrow growth rings, it is impossible to determine the season of felling.

Number of rings: The total number of measured rings included in the samples analysed.

Mean ring width: This, simply put, is the sum total of all the individual ring widths, divided by the number of rings, giving an average ring width for the series.

Mean sensitivity: A statistic measuring the mean percentage, or relative, change from each measured yearly ring value to the next; that is, the average relative difference from one ring width to the next, calculated by dividing the absolute value of the differences between each pair of measurements by the average of the paired measurements, then averaging the quotients for all pairs in the tree-ring series (Fritts 1976). Sensitivity is a dendrochronological term referring to the presence of ring-width variability in the radial direction within a tree which indicates the growth response of a particular tree is "sensitive" to variations in climate, as opposed to complacency.

Standard deviation: The mean scatter of a population of numbers from the population mean. The square root of the variance, which is itself the square of the mean scatter of a statistical population of numbers from the population mean. (Fritts 1976).

Felling seasons and dates/date ranges is probably the most important column of the summary table. Here the actual felling dates and seasons are given for each dated sample (if complete sapwood is present). Sometimes it will be noticed that often the precise felling dates will vary within several years of each other. Unless there is supporting archaeological evidence suggesting different phases, all this would indicate is either stockpiling of timber, or of trees which have been felled or died at varying times but not cut up until the commencement of the particular building operations in question. When presented with varying precise felling dates, one should always take the *latest* date for the structure under study, and it is likely that construction will have been completed for ordinary vernacular buildings within twelve or eighteen months from this latest felling date (Miles 1997).

Table 2: Matrix of *t*-values and overlaps for same-timber mean and site master

Components of timber mean **wrbv1**

Sample: *Last ring date AD:*	**wrbv1b**
wrbv1a	8.85 / 2.27

Components of timber mean **wrbv11**

Sample: *Last ring date AD:*	**wrbv11b**
wrbv11a	9.14 / 17

Components of site master **WRBVx1**

Sample: *Last ring date AD:*	**wrbv2**
wrbv1	4.19 / 26

Components of site master **WRBVx2**

Sample: *Last ring date AD:*	**wrbv13** 1747-1819	**wrbv17** 1745-1813	**wrbv14** 1751-1813
wrbv12 1746-1820	2.13 / 73	3.90 / 68	1.67 / 63
	wrbv13	1.86 / 67	5.08 / 63
		wrbv17	0.30 / 63

Table 3: Dating of site master **WRBVx2** (1745-1820) against reference chronologies

	State or region:	*Chronology name:*	*Short publication reference:*	*File name:*	*Spanning:*	*Overlap:*	t-*value:*
*	Virginia	Bacon's Castle Slave Quarters, Surry	Miles and Worthington 2009/05	BAC	1730-1847	76	7.02
*	Virginia	Four Square Slave Quarters, Smithfield	Miles and Worthington 2009/05	FSQx2	1728-1829	76	6.31
	Virginia	Virginia Area Pine Master Chronology	Worthington 2012	VAPINE2B	932-1985	76	6.22
	Washington DC	Tudor Place, Center Block	Worthington and Seiter 2014/18	TPDCx1	1682-1816	72	4.97
	Virginia	Gloucester Courthouse Oak Master	Miles and Worthington 2006/55	GLOx1	1702-1823	76	4.97
*	Virginia	St. Johns Church, Richmond	Miles and Worthington 2008/36	SJC	1556-1849	76	4.93
	Washington DC	Tudor Place, East Wing Attic	Worthington and Seiter 2014/18	TPDCx4	1693-1795	51	4.81
	Virginia	Warren House (Smith Fort)	Heikkenen Archive	warrenSI	1716-1839	76	4.81

Chronologies in **bold** denote regional masters

* = Component of **VAPINE2B**

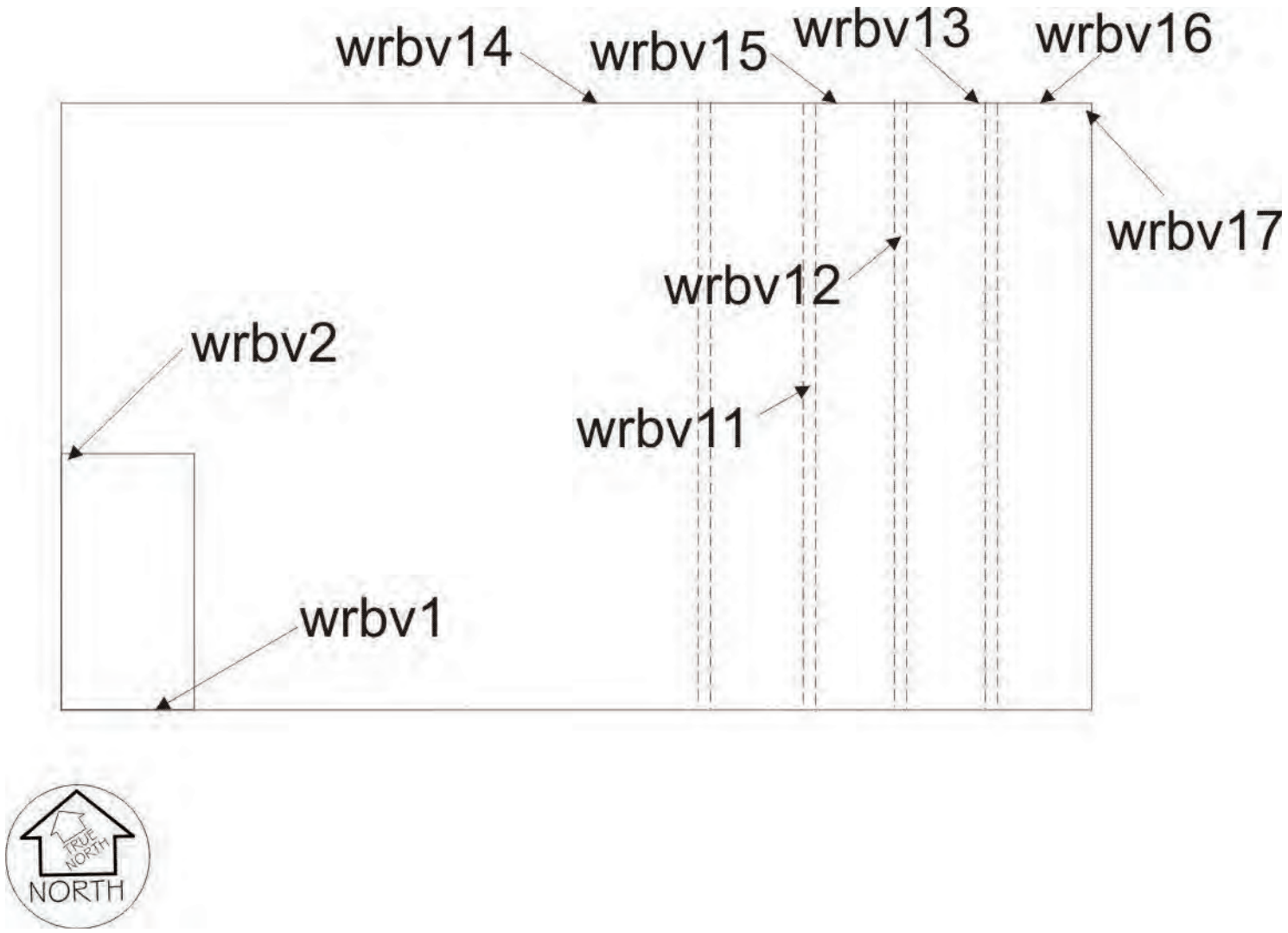

Figure 2. Sketch drawing of the Walter Reed Birthplace showing sample locations on the first floor.

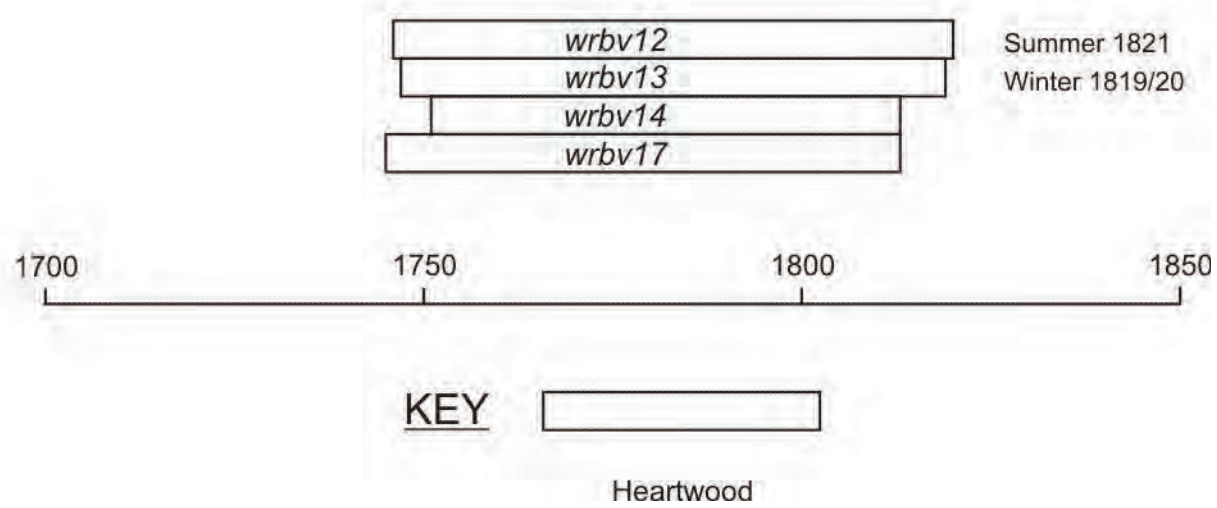

Figure 3. Bar diagram showing dated timbers in chronological order.